BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents *will not* correct images, please do not report the images to the Image Problem Mailbox.

REMARKS

Claims 1-15 and 27-29 are pending in the application with claims 1, 3-6, 8, 10, 11, 13, and 28 amended herein and new claim 29 added herein. Applicant expresses appreciation for the indication that claims 4, 8, 11, and 13 are allowable.

Claims 1-12, 27, and 28 stand rejected under 35 USC 102(a) as being unpatentable over Fukuzumi in view of Tseng. Applicant requests reconsideration.

It is apparent from the listing of allowed claims and from the rejected claims addressed in the detailed arguments on pages 3-4 of the Office Action that the Office intended to reject claims 1-3, 5-7, 9, 10, 12, 14, 15, 27, and 28 instead of claims 1-12, 27, and 28. Claims 4, 8, and 11 were mistakenly listed as rejected.

Accordingly, Applicant herein amends claims 1 and 10 to incorporate the subject matter of respective claims 4 and 11 along with any intervening claims. Applicant also herein rewrites claims 8 and 13 in independent form including all the limitations of their respective base claims. Claim 28 is amended to set forth undoped hemispherical grain polysilicon as in allowable claim 11. New claim 29 sets forth chemisorbing first and second precursor layers as in allowable claim 13. Applicant requests allowance of claims 1-3, 5-7, 9, 10, 12, 14, 15, 27, and 28 in the next Office Action.

Applicant herein amends the specification to correct errors that occurred in converting conductivity data from units of Ohm^{-1} $meter^{-1}$ to units of $microOhm^{-1}$ $centimeter^{-1}$, as used in the present specification. Applicant asserts that, pursuant to MPEP 2163.07, the amendment is not new matter since it merely corrects an obvious error. Those of ordinary skill would recognize the existence of the error as well as the appropriate correction. For example, page 12, lines 16-18 of the present specification states that semiconductive material has a conductivity of about 10^4 to about 10^{12}

microOhm^{-1} centimeter^{-1}, but those of ordinary skill readily recognize that the stated range sets forth too high of conductivity for semiconductive material.

Page 523 of "Introduction to Materials Science for Engineers," a copy of which is attached hereto, states that semiconductive material has a conductivity in the range of 10^{-4} to 10^{4} Ohm^{-1} meter^{-1} (10^{-12} to 10^{-4} microOhm^{-1} centimeter^{-1}). It is readily apparent that the incorrect range of conductivity set forth in the present specification may be obtained by applying a conversion factor of 10^{8} to the range set forth on page 523 of the reference. Also, it is apparent to those of ordinary skill that a conversion factor of 10^{-8} should instead be applied to the range set forth on page 523 of the reference to convert units of Ohm^{-1} meter^{-1} to microOhm^{-1} centimeter^{-1}. Respective amendments are made to the values described on page 12, lines 13-16. At least for such reasons, Applicant asserts that the amendments do not constitute new matter.

Applicant previously filed Information Disclosure Statements on April 2, 2003 and October 14, 2003 and has not yet received an initialed Form PTO-1449 indicating consideration of the references cited therein. A copy of the previously submitted October 14, 2003 IDS is included for the Office's convenience. Applicant requests consideration of the references and return of the initialed forms.

Adequate reasons are set forth herein establishing patentability of claims 1-15 and 27-29 and Applicant requests allowance of all pending claims.

Respectfully submitted,

Dated: 30 Mar 2004 By: _____

James B. Lake
Reg. No. 44,854

INTRODUCTION TO Materials Science FOR Engineers

SECOND EDITION

James F. Shackelford
University of California, Davis

Macmillan Publishing Company
New York

Collier Macmillan Publishers
London

Sample Problem 11.4-2

The polarization for a ferroelectric is defined as the density of dipole moments. Calculate the polarization for tetragonal $BaTiO_3$.

Solution

Using the results of Sample Problem 11.4-1(a) and the unit cell geometry of Figure 11.4-3, we obtain

$$P = \frac{\Sigma Qd}{V}$$

$$= \frac{10.56 \times 10^{-30}\ \text{C} \cdot \text{m}}{(0.403 \times 10^{-9}\ \text{m})(0.399 \times 10^{-9}\ \text{m})^2}$$

$$= 0.165\ \text{C/m}^2$$

■

11.5 Semiconductors

The magnitudes of conductivity in the semiconductors in Table 11.1-1 fall within the range 10^{-4} to $10^{+4}\ \Omega^{-1} \cdot \text{m}^{-1}$. This intermediate range corresponds to band gaps of less than 2 eV. As shown in Figure 11.2-8, both conduction electrons and electron holes are charge carriers in a simple semiconductor. For the example of Figure 11.2-8 (pure silicon), the number of conduction electrons is equal to the number of electron holes. Pure, elemental semiconductors of this type are called *intrinsic semiconductors*. This is the only case we shall deal with in this chapter. In Chapter 12, the important role of impurities in semiconductor technology will be demonstrated in our discussion of *extrinsic semiconductors*, semiconductors with carefully controlled, small amounts of impurities. For now, we can transform the general conductivity expression (Equation 11.1-6) into a specific form for intrinsic semiconductors:

$$\sigma = nq(\mu_e + \mu_h) \tag{11.5-1}$$

where n is the density of conduction electrons (= density of electron holes), q the magnitude of electron charge (= magnitude of hole charge = 0.16×10^{-18} C), μ_e the mobility of a conduction electron, and μ_h the mobility of an electron hole. Table 11.5-1 gives some representative values of μ_e and μ_h together with E_g, the energy band gap and the carrier density at room temperature. Inspection of the mobility data indicates that μ_e is consistently higher than μ_h, sometimes dramatically so. The conduction of electron holes in the valence band is a relative concept. In fact, electron holes exist only in relation to the valence electrons; that is, an electron hole is a missing valence electron. The movement of an electron hole in a given direction is simply a representation that valence electrons have moved in the opposite direction (Figure 11.5-1). The cooperative motion of the valence electrons (represented by μ_h) is an inherently slower process than the motion of the conduction electron (represented by μ_e).